subsidy. Using results generated by the Hatfield Model would cause subsidies to flow incorrectly.

Even in remote offices, the switching investment required to equip the office is well over one hundred thousand dollars, before adding line capacity. Properly trended actual historical data should help to ease the burden of projecting switching costs, and produce results that are more realistic than those produced by Hatfield.

Using published or negotiated prices can be misleading because the surrounding terms and conditions may deal with related matters that affect the bottom line price. For example, a company can negotiate per-line prices for switching, but these negotiations usually involve other issues as well, such as training for employees and software upgrades to other switches. Thus, other "Terms of Agreement" may commit the purchasing company to future expenditures that are not adequately captured in the "per line price." Additionally, negotiated prices often include just a small subset of a LEC's network. For example, a company may agree to negotiate for the replacement of all analog switches, leaving the rest of the network subject to standard pricing.

C. The Hatfield Model Improperly Ignores Software Upgrade and Growth Expenses.

The Hatfield Model ignores the software expense associated with growth and with software upgrades. Switch software investments and expenses are significant costs incurred by switch consumers such as GTE. Software costs are an integral cost of the switch investment, and are appropriately capitalized by telephone companies when the software is purchased in conjunction with the initial purchase of a switch. Switch software (such as upgrades) that is purchased and installed after the initial purchase and deployment of a switch is appropriately expensed. Software upgrade purchases allow switches to function more effectively, efficiently, and economically than earlier versions might have allowed.

LECs purchase switching equipment from major switch vendors. Switches require software upgrades on a scheduled basis to keep current with the latest software release (referred to as "generic programs"). Failing to keep current with the latest generic program can cause the LEC to lose support from the switch vendor. Also, failing to keep current, or skipping new software releases, can cause LECs to incur greater expenses, at a later date, due to higher costs of upgrading a switch that has not been previously upgraded. Moreover, switches need to keep current with the latest software generics to be able to satisfy mandated services, such as number portability. They also provide features that LECs will be obligated to make available either as UNEs or in conjunction with UNEs. As an example, GR-303, which provides standards for interfacing NGDLC (Next Generation Digital Line Carrier) to digital switches, recommends the addition of an operations interface functionality in the switch to consolidate the provisioning, testing and maintenance of integrated loops, including those that will be unbundled. The implementation of GR-303 will undoubtably require upgrades to existing switch software.

While the NBI study relied upon by the Hatfield modelers to estimate future switch investment predicts that switch prices will decline in future years, the study also predicts that demand for software additions will increase at the same time. This increase in software sales and corresponding increased expense is a function of the bargaining for switch line prices between switch purchasers and switch producers.

While the discounts for switch line prices may seem steep currently, there is a future increased cash outflow for switch software associated with the initial switch purchase. The Hatfield Model considers only a portion of the initial capital outflow requirement, disregarding future software expense increases.

Despite the importance of utilizing proper switch software in an efficient network, the authors of The Hatfield Model have not included any switch software expense.[3] This is a grave oversight. Indeed, LECs spend over $1 billion annually on switch software upgrades.

D. The Hatfield Model's Switch Algorithms Fail To Incorporate Basic Engineering Principles and Do Not Permit Users To Adjust Switch Costs To Account For Critical Measurements

The Hatfield Model fails to employ standard switch engineering practices, does not account for several switching investment components, and prevents users of the Model from making necessary changes regarding switch investment in order to generate more accurate cost estimates. It does not provide the capability to adjust switch costs to account for the following measurements that are critical for network sizing:

1. Centum Call Seconds ("CCS")

Network engineers size their networks to carry the offered load measured in CCS. CCS is one of the most important measurements that local telephone companies

[3] As stated in the Hatfield Input Portfolio, Section 5.4.7., Hatfield explicitly excludes software expenses.

utilize to size and monitor their networks. The Hatfield Model, however, neither displays CCS nor provides a user adjustable input for CCS per line. Hatfield arrives at a CCS/MS value in the model, but this calculation takes place in the r31_switching_io.xls module, which allows no input changes and is not visible during the normal running of the model. In fact, this value is never displayed in any worksheet, is not viewable, and is not used in any downstream calculations. It is unclear why Hatfield even calculates this understated value in the first place. There is no input change allowed and there is no relationship to other spreadsheet cells.

Every central office switch in the country has a declared CCS per line value, or per main station ("CCS/MS"), which represents the office's usage activity. CCS/MS for the office is determined during the busiest hour of the busiest 10 days of the year:" *... the network is effectively designed to be virtually non-blocking for the average of the ten highest days.*"[4] This CCS value indicates to engineers the level of switching activity for which capacity must be provided. Engineering tables provide the engineer with threshold value limits and service level parameters, and denote adequate switch capacity for certain CCS levels at both the subsystem (discussed in more detail below) and central processor level. The Hatfield Model uses its own unique approach, which ignores the peak nature of telecommunications traffic and is neither effective nor actually used in the engineering community.

[4] An Updated Study of AT&T's Competitors Capacity to Absorb Rapid Demand Growth, Page 35.

2. Line concentration ratio calculations

A network engineer must consider the composite usage of all lines and trunks in order to determine the overall line concentration ratio ("LCR") for a given switch. To properly design and engineer a switch, switching subsystems, such as line units, must be equipped with sufficient call capacity. Bellcore confirms this requirement by stating that "call capacity must be defined with respect to both a global view and a component view of the switch;"[5] however, the Hatfield Model does not properly account for either view.

The most critical calculation in switch sizing is the determination of how many switch lines can be contained in a line subsystem. This calculation determines the LCR. The LCR determination has implications that affect not only the performance of the switch but also the total cost. The overall LCR determines how many lines can be contained in a peripheral unit. This peripheral unit (line unit, line concentrating module, etc.) is the basic foundation of the switch that limits the throughput capacity (CCS), provides the interface to customers, determines the number of bays and the overall office footprint, and has a major impact on costs. These peripherals must be properly engineered before any throughput calculations on central processors and common units can be performed, for it is these units that process calls both to and from subscribers. The Hatfield Model fails both to perform the critical LCR calculation, and to

---

5 Section 17, LSSGR, Issue 3, March, 1989, TR-TSY-000517.

properly engineer the necessary peripherals, thereby making false assumptions about switching capacities and costs.

3. Capacity considerations

The Hatfield Model attempts to size all switches with the same set of parameters and applies neither individual switch engineering principles nor peripheral unit engineering considerations when sizing such switches. This oversimplification produces switches and associated costs that will not support the traffic load of its subscribers. In addition, The Hatfield Model neglects to consider adequate spare capacity that is necessary for the efficient operation of an end office switch. These matters are discussed below.

a) Administrative line fill

Administrative line fill is necessary to provide spare line equipment used for load balancing, defective line cards, peaks in demand, and other administrative switching processes. The Hatfield Model imputes the cost of a 98% administrative fill level into the per-line cost.

This 98% fill level is neither acceptable nor forward-looking. Discussions with different telephone companies reveal that the current fill level is between 92% and 96%, with Internet and other high usage trends leading toward forward looking fill levels around 90%. Currently, switch engineers across the country generally use the more realistic administrative fill level of 95%.

At a conservative 95% level, an additional investment of 3% relative to the Hatfield Model's switching investment is required to maintain adequate switching capacity. Proponents of the Hatfield Model support this requirement, noting that spare line capacity must be present for load balancing of high usage lines.[6] Since line equipment has limited capacity (both physical and call carrying), obtaining optimal balance can only be achieved when sufficient physical and call carrying capacity exist.

More importantly, because growth lines are not provided in the Hatfield Model's switch investment, spare line capacity must made be available. The switch equipment represented in the NBI study indicates that 85% of all new line equipment serves working lines. This means that initial purchases for line equipment include 15% spare capacity. This spare capacity is available for growth lines and load balancing during the engineering period. This also reflects the fact that LECs purchase lines two to three years in advance with a 5% engineered spare capacity.[7] This practice is indicative of sound engineering practice. Failure to provide this capacity creates a switch with inadequate functionality, overloaded line equipment, bottlenecked call processing, and generally poor service. As previously mentioned, Hatfield addresses this concern by imputing 2% to the "per-line" cost, effectively provisioning exactly 100% of the 1995 ARMIS line count at a 2% higher cost. This type of modeling is inconsistent with sound engineering practices and improperly results in understated switch sizes, investments, and expenses. By avoiding the purchasing of the required administrative spare line capacity, the Hatfield Model not only understates the switching investment, but also

---

6 Reply Declaration of AT&T witness Catherine Petzinger, California OANAD proceeding, Docket No. R. 93-04-003, I. 93-04-002, April, 1997, Page 7.

7 LEC line growth is estimated at 3-4% per year.

understates the expense related to maintaining the added capacity such as software upgrade costs, and line maintenance and installation costs.

b) High usage lines

The Hatfield Model also fails to account for the increasing number of high usage lines on a forward looking basis. High usage lines require much lower line concentration ratios (with their attendant lower line fills and higher costs) to maintain acceptable service levels. High usage lines are typically centered around a geographical area, such as locations of Internet Access Providers. Engineers consider the effects of this high usage on the telecommunications network and adjust line fills and trunk groups accordingly. The costs of adjusting to these high usage factors take the form of either lower line concentrations or lower allowable administrative line fill levels. In order to load balance a switch, there must be some place in the switch that has spare capacity in which to place the overload. Absent spare equipment, there can be no load balancing and high usage lines will produce traffic congestion and overload conditions. While the Hatfield Model's proponents claim that these lines can be absorbed into spare capacity, no spare capacity exists within the Hatfield Model's network.

Most states have seen tremendous growth in traffic over the last twelve months, a large portion of which can be attributed to Internet usage. Internet calls produce a disproportionately large volume of usage due to their extremely long holding times." Internet traffic is circuit switched through LEC networks; thus, the added costs of its capacity demands are forward-looking requirements. The Hatfield Model, however, disregards these costs.

c) Switch line modularity

The Hatfield Model's practice of averaging switch sizing omits the cost of modularity of the switching algorithm entirely. Hatfield wrongly assumes that one single line can be purchased at a time. In fact, Hatfield models switch sizes that are smaller than even the minimum size that one can purchase. For example, Lucent Technology's 5ESS switch is comprised of switch modules that house and interface analog lines and Digital Loop Carriers. The subsystem that contains analog lines is the line unit. This unit comes equipped with line grids that can provide multiples of 64 lines. The line unit is required whether there are 64 lines or 640 lines terminated in the unit. This line unit, and the frame, cabling, time slot inter-exchange unit, and the switch module processor unit all have a basic minimum cost regardless of the number of lines equipped in the unit.

It is simply not possible to purchase a single line at a time in the 5ESS switch, as assumed by The Hatfield Model, due to its modular construction. By overlooking this modularity, Hatfield overlooks all costs beyond the currently demanded lines, and underestimates the costs associated with the lines it counts. The same logic applies to Nortel switches. While it is possible to purchase a single line card for the Nortel switch, there must be a slot in the switch line drawer in which the single line can be placed. Hatfield does not consider the costs associated with pre-provisioning a line drawer, line concentration module, frame work, or other peripheral equipment required to accommodate single line growth.

4. Office sizing techniques

Office CCS values are not user adjustable in the Hatfield Model. Even if the CCS values were user adjustable, the Model would not arrive at the same outputs as LECs for several reasons. First, the Hatfield Model calculates CCS based on 1995 ARMIS reported DEMS, 1989 LSSGR busy hour call attempt estimates, and straight-line averaging. This sizing technique is unique to Hatfield. None of these elements is actually used in real-world engineering. Second, Hatfield claims that dividing annual usage by the number of business days in the year will determine the daily load on the network. Third, Hatfield claims that switching and IOF networks should be built to handle only 10% of this averaged business day traffic.

These mistaken assumptions are the basis from which Hatfield derives all switching and transport values. Modeling a network with these assumptions would be similar to claiming that if the total annual rainfall in a given state was 52 inches, one could expect one inch of rain to fall each week, in each town, throughout the year.

Network traffic is not evenly dispersed over the entire year or the entire network, and real networks are not built based on a straight-line average of annual data. The Hatfield Model's oversimplification will not provide an adequate network or acceptable service levels.

5. The cost of subsystems

Networks are built to carry the offered load during the busiest hours of the busiest season, yet the Hatfield Model does not provide an adequate method of estimating this type of peak season traffic load. Network engineers are trained to understand telephone traffic. This training, coupled with actual experience, provides a basis for engineering judgment, which is utilized in conjunction with timely data analysis to determine network sizing. It is a gross understatement to oversimplify the engineering effort with broad gauge averaging and straight line, level loading assumptions.

Bellcore confirms this engineering principle within the LSSGR, which is cited by Hatfield as support for some of its engineering assumptions and default inputs. The LSSGR notes that "the traffic volume offered to an SPC[8] switch depends on geographical area, class of service mix, and time of day. The method to estimate the Average Busy Season (ABS) and High Day (HD) customer line usage (with the above factors) is described in LSSGR Sections 17.6.2 and 17.6.3."[9] These sections contain engineering guidelines, formulas, and charts useful in determining customer line calling rates and usage. Hatfield takes busy hour call attempts from the LSSGR, which reflects data compiled from three Bell Operating Companies in 1989, and uses some of these average values in the Model's algorithms. Hatfield does not, however, adjust the 1989

---

8 SPC refers to Stored Program Control switches, which includes all switches controlled with software.

9 Section 17, LSSGR: Issue 3, March 1989 TR-TSY-000517.

figures to take into account today's network traffic assimilated with increase of usage, Internet access, and data communications.

E. Trunk Quantities Need to be Sufficient to Support Network Traffic.

Trunking is an integral part of the switching function. If a sufficient number of trunks and trunk capacity are not provided, the switch becomes inoperable. The Hatfield Model contains serious flaws with respect to switched trunks, as discussed below.

1. Switch trunk demand is far greater than is purported in the modeled network

The LECs equip their switches with trunks determined by both the demand of switched network traffic and demand from the IXCs. Hatfield attempts to model the demand generated by switch usage and attempts to calculate the required number of trunks to carry that load. There are discrepancies in the computation of this usage since the assumptions used to calculate demand are at least eight years old[10] and Hatfield depends on assumptions that are inconsistent with sound engineering principals and logical sizing techniques. These incorrectly used assumptions create trunk quantities and investments of trunks that explain the huge differences between the modeled and actual network.

---

[10] The Model Description (p.43) state that "Many of the calculation in the Switching and Interoffice Module rely on traffic assumptions suggested in Bellcore Documents." The Bellcore document reference is dated March, 1989

For example, in Hawaii, GTE has 172,763 installed trunk ports, while the Hatfield Model predicts only 53,822 trunk ports. This difference represents 118,941 missed trunk ports in the Hatfield modeled network. At a cost of $305 per trunk port,[11] this difference equates to over $36 million in missed switching investment. Similar results were obtained in the State of Washington. Additional reasons for this difference are discussed, in more detail, throughout the remainder of this section.

2. Hatfield wrongly reduces switching investment associated with trunk ports.

The formula contained in the r31_switching_io.xls spreadsheet calculates a reduction of $6.67 from the switch curve line prices by subtracting $100/15=6.67 from the switch curve price. This reduction is performed after the reduction of $16 that Hatfield claims is the trunk port reduction takeaway from NBI's average line price.[12] Hatfield arrives at the new reduction value from the formula contained in cell address E2 of the wire center investment spreadsheet in the r31 module. This formula calculates the switch line price by subtracting 14.922 times the log of the number of lines divided by the quantity of trunks in the wire center. Next it divides by the administrative fill percentage (.98) and subtracts the $6.67 additional trunk port reduction ($100/15) and then subtracts the analog circuit offset for DLC lines ($5.00). The remainder of the formula adjusts the per line investment to account for SS7 links

---

[11] NBI "U.S. Central Office Equipment Market 1996 Database", January 1997, Exhibit 3-37, Row 211, Column 1995.

[12] AT&T's response to GTE's Seventh Set of Data Requests, Washington Consolidated Cost Docket, UT-960369,-70,-71, Request No.146, June 13, 1997.

and switched trunks and again divides by the administrative line fill (.98). This formula inappropriately reduces switching investment per line by an unexplained $6.67 (assuming the Hatfield user adjustable default trunk value is set at $100.).

Effectively, the model first reduces the switching investment by removing the $16 per trunk port from the switching line price curve external to the model. This $16.00 is derived using a 6:1 line-to-trunk ratio ($100/6~$16).[13] Hatfield again reduces the per line prices by the $6.67 calculated in the above referenced cell address. This reduction is the result of applying a 15:1 line-to-trunk ratio. Hatfield finally adds the cost of trunk ports to the switching investment at the calculated line-to-trunk ratio, which, in Hawaii computes to 14:1 (despite the fact that Hatfield in its model description states that 6:1 is the basis for the calculation).[14] Even though the trunk cost is user adjustable, this formula disconnects this user input value from the model and substitutes it with a Hatfield-massaged and reduced value. The investment shortfall for switching costs can be computed by multiplying the number of lines times $6.67(when the trunk port user adjustable input is set at $100.00).

3. Hatfield excludes capitalized labor costs associated with trunk installation.

The installation of switched DS-0 level trunks requires circuit design, central office translations and initial testing prior to turn-up of the trunks. The labor associated with these activities is capitalized labor associated with the trunk investment. An AT&T

13 Hatfield Model Description, Release 3.1, Page 46.

14 Id.

study provides details of capitalized labor required to install trunks. The value identified in this study is $45 per trunk.[15] Hatfield ignores the required capitalized labor to build trunks.

4. Minutes of Use Per Trunk Must be Reasonable.

Another major deficiency in the model platform is the amount of traffic that Hatfield expects each DS-0 level switched trunk to be able to handle. A significant and basic tenet of traffic engineering is that the larger a trunk group, the more traffic in terms of minutes of use per year each DS-0 level switched trunk within the group will be capable of handling. In an effort to demonstrate this principle, the following illustrative table was developed:

15 AT&T Bell Laboratories, "A Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth." June 20, 1990, p. 7.

Trunk Usage Analysis Table

A	B	C	D	E	F
Number of trunks contained in the switched trunk group	Switched Trunk Group: **Maximum Theoretical CCS per Busy Hour**	Switched Trunk Group: **Maximum Engineered CCS per Busy Hour**	Switched Trunk Group: **Maximum Percent Utilization per Busy Hour**	Individual Switched Trunk: **Maximum Engineered CCS per Busy Hour**	**Minutes of use** per switched trunk per year
Source: Assumed	Source: Calculated A x 36	Source: Poisson Capacity Table 10 for 1% Blocking	Source: Calculated (C / B)100	Source: Calculated C / A	Source: Calculated E x 100 / 60 min. / .10 x 270 Bus. Days
1	36	.4	1.1%	.4	1800
5	180	46.1	25.6%	9.2	41400
24	864	507.0	58.7%	21.1	94950
48	1728	1201.0	69.5%	25.0	112500
72	2592	1935.0	74.7%	26.9	121050
84	**3024**	**2310.0**	**76.4%**	**27.5**	**123750**
96	3456	2689.0	77.8%	28.0	126000
120	4320	3456.0	80.0%	28.8	129600
144	5184	4231.0	81.6%	29.4	132300
168	6048	5015.0	82.9%	29.9	134550
192	6912	5804.0	84.0%	30.2	135900

(Note: 27.5 CCS represents the Hatfield assumption)

Column "**A**" represents a range of assumed DS-0 trunk quantities in a given switched trunk group. For the most part, trunk group sizes in increments of 24 trunks have been displayed, in order to be consistent with the trunk group sizes that are normally built by LECs and IECs due to modularity considerations with respect to digital interface frames and interoffice facilities.

Column "**B**" signifies the maximum theoretical busy hour (BH) CCS of switched trunk usage or call carrying capacity associated with the assumed switched trunk group. These values were calculated by multiplying the Trunk Group size by 36 CCS. Essentially, CCS is a measurement of time, where one CCS equals 100 seconds. The telecommunications industry utilizes this standard measurement to engineer systems and components that are traffic sensitive, i.e., switched trunk groups.

Column "**C**" depicts the maximum engineered BH CCS call carrying capacity, at a one percent blocking level, for the associated switched trunk group sizes. These values were obtained from the Poisson Capacity Table 10,[16] in order to maintain acceptable blocking standards. Poisson tables are used to engineer switched trunk group requirements, where the incidence of blocking is to be held to an acceptable service level. Poisson capacity tables have been computed from the mathematical formula commonly referred to as the "Poisson" distribution. This formula is based on certain assumptions with regard to the characteristics of the traffic which flows over the trunk group and the distribution of the traffic among the individual trunk group members.

---

[16] AT&T Traffic Facilities Practice, May 1976, Division D., Section 1-g.

Column "D" reports the maximum engineered BH percent of switched trunk group utilization. These values were calculated by dividing the value in Column "C" by the corresponding value in Column "B", and then multiplying the quotient by 100. Column "**E**" measures the maximum engineered BH CCS capacity per individual switched trunk within the trunk group.

The final column, column "**F**," indicates the effective minutes of use per DS-0 level switched trunk per year for a DS-0 level trunk contained in a specified trunk group size. These values were calculated by multiplying the value in column "E" by 100, to convert the Maximum Engineered CCS per B.H. to B.H. total seconds of use. The BH total seconds of use is then divided by 60 seconds to develop BH total minutes of use. The BH total minutes of use is further divided by .10 to convert to Total Day minutes of use. The Total Day minutes of use is then multiplied by 270 Business Days to determine the total minutes of use per trunk per year.

The .10 value is used in column "F" because Hatfield assumes that 10% of the traffic occurs in the busy hour. Hatfield further assumes that there are 270 business days per year despite the fact that its own sources (AT&T's updated Study of Competitors' Capacity to Absorb Rapid Demand Growth (page 25) and their original Study of Competitors' Capacity to Absorb Rapid Demand Growth (page 10)) state that there are 264 business days per year. The Hatfield Inputs Portfolio for Release 3.1 on page 59, section 4.3.13., assumes the default value of 270 business days, whereas the support notation cites "The AT&T Capacity Cost Study uses an annual to daily usage reduction factor of 264 days" which is another example where Hatfield chooses to arbitrarily reduce the costs by using a value of 270 annual business days.

Furthermore, the New Hampshire study that Hatfield relies on for the switch and circuit equipment maintenance factors contains a value of 261 non-holiday week days (business days) per year.[17] Neither of Hatfield's assumptions are necessarily accurate because each switch has its own characteristics and many switches process more than 10% of their business day traffic in their respective busy hours. The use of 264 business days, instead of 270 business days, yields an annual total minutes of use per switched trunk of 92,840 for a trunk group size of 24 trunks instead of 94,950 displayed on the preceding table for a group of 24 trunks.

Examination of Columns "D" and "E" clearly demonstrate that the BH call carrying capacity or efficiency of a switched trunk group increases as the size of the trunk group (quantity of trunk members) increases. Further examination of column "F" demonstrates that the total minutes of use per switched trunk per year increases as the size of its trunk group increases.

Contrary to the above principle, the Hatfield platform only allows for a single input for the maximum utilization of a switched trunk during the busy hour (B131, default input value of 27.5 CCS).[18] The platform should allow for multiple input values that are more appropriate for the offered traffic served by the size of the wire center and associated trunk network. The use of a single CCS (or maximum trunk utiliziation %)

---

[17] 1993 New Hampshire Incremental Cost Study, page 39,261 non-holiday week days.

[18] Hatfield Inputs Portfolio, Release 3.1, Inputs, Assumptions and Default Values, page 45, B131. Maximum Trunk Occupancy, CCS.

precludes both accurate trunk group sizing and the accurate computation of required trunk port switch investment).

The Poisson Capacity Table 10, at a maximum engineered BH level of 27.5 CCS indicates that a trunk group size of 84 switched trunks would be required to support the offered load, at an acceptable level of blocking. A trunk group size of 84 switched trunks is considered a very large trunk group. However, an LEC network consists of numerous end office switches that handle relatively less traffic as compared to AT&T switches. AT&T has recognized this in its updated Study of Competitors' Capacity to Absorb Rapid Demand Growth at page 16, Section 3.1.1.3, where it states that "Access DS-0 trunk utilization is estimated to be 96,000 minutes of use per trunk per year (i.e., 80% of 120,000 minutes per inter-switch trunk per year)." The interswitch trunks referred to in the above cite are those trunks contained in the much larger trunk groups that connect IEC switches to one another.

Both AT&T and MCI readily acknowledge this distinction in traffic patterns between IEC networks and the LEC networks, as evidenced by the following cites:

"Intercity long distance networks are high usage facilities, requiring relatively little switching investment, with more flexibility in right-of-way selection between distant points. In contrast, local networks are constructed to specific premises for individual customers, not general areas."[19]

[19] Supplemental reply Testimony of John C. Klick on Behalf of AT&T Communications and MCI, Washington Utilities and Transportation Commission, Docket Nos. UT-960369,-70,-71, June 20, 1997 at page 4 Lines 10-14

"AT&T generally employs the Lucent 4ESS switch, which is designed to handle massive switching volumes. Very few LECs employ the 4ESS switch, because they simply do not have the switching volume that would justify switches of this size. Similarly, the cross-connect system on AT&T's large 4ESS switches is substantially more complex than the cross-connects found in most LEC switches. One reason that AT&T's switches handle so much more volume than the typical wire center switch is because AT&T uses so many fewer switches nationwide. Currently, AT&T utilizes only 137 4ESS switches nationwide. In contrast, LECs employ more than 23,000 local switches in their local exchange networks nationwide (First Report and Order, paragraph 411). As a result, the typical AT&T switch handles traffic routing for multiple cities or an entire state, while the typical LEC local switch handles the routing for approximately 6,000 customers."[20]

Hatfield, despite this clear and concise distinction in the AT&T Study of Competitors' Capacity to Absorb Rapid Demand Growth (page 16), insists on using 123,750 (Trunk Usage Analysis Table- Column "F" for a trunk group size of 84 trunks) minutes rather than the more appropriate 96,000 minutes per year, and to be more precise 92,840 as mentioned above or less when the busy hour traffic exceeds 10% of daily usage.

The LEC traffic is dispersed to a variety of end offices and a variety of POPs. Hatfield assumes five POP locations per tandem and thus should assume five separate direct access trunk groups per end office (e.g., one direct access trunk group from each

[20] Id. at 21-26.

end office to each of the five POPs). In addition, the LEC network consists of many direct trunk groups, which connect end offices to other end offices. Typically an end office would have 20 or 30 or more separate trunk groups to surrounding end offices, local and access tandems. These LEC trunk group sizes are considerably smaller than IEC trunk groups. The sizing of the groups is wholly dependent on the traffic load to be carried on the individual groups. Thus, a single CCS or percent trunk utiliziation factor is simply wrong. Hatfield does not model switched trunk groups at all. Rather the model calculates total minutes of traffic by type (e.g., local direct, local tandem, intra LATA direct, intra LATA tandem, access direct, access tandem, and operator).

Hatfield ignores the fact that this traffic must be dispersed in precisely the manner described above and acknowledged by Mr. Klick's testimony in Washington.[21] Hatfield even ignores its own assumption that there are five POPs per access tandem, which should mean that each LEC end office should contain five separate direct access trunk groups (assuming sufficient traffic to warrant direct rather than strictly tandem-routed traffic), each with a minimum of 24 trunks. This results in a gross understatement of modeled switched trunks than would actually be required.

The crossover point for direct trunk groups versus routing via tandems is normally in the range of seven to ten trunks. LEC's networks are structured with direct trunk groups to end offices and POPs that have a strong community of interest with the originating end office. Given the crossover threshold of seven to ten trunks and the

[21] Supplemental Reply Testimony of John C. Klick on Behalf of AT&T Communications and MCI, Washington Utilities and Transportation Commission, Docket Nos. UT-960369,-70,-71, June 20, 1997, Page 4.

modularity considerations previously discussed when the traffic volume approaches the crossover point, a group of 24 trunks should be built by the LEC.

The above traffic engineering and network trunking efficiency concerns are of particular interest with respect to Universal Service. The required funding support or subsidy for universal service is likely to target smaller end offices will be dependent to some extent on the larger end offices. Hatfield's platform, however, does not recognize nor address the issue of trunk group size and efficiency (i.e., annual minutes of use).

F. The Mechanism Must Include Trunks for Those Services Embraced as Part Of Universal Service by the Commission.

The *Universal Service Order* defined the services that must be part of universal service. The Hatfield Model fails to provide the necessary trunks to provide these services as mandated. Indeed, E911 Service,[22] Announcement Services,[23] and tandem-to-tandem calls[24] cannot be provided over the network modeled by Hatfield, because the trunks necessary to carry the traffic do not exist in the Model. It is critical that the mechanism adopted by the Commission is able to provide the services that the

---

[22] Supplemental Responses of AT&T to GTE Northwest Incorporated's Seventh Set of Data Requests, Washington Consolidated Cost Docket Nos. UT-960369,071,-71, Request No. 149, June 23, 1997.

[23] Supplemental Responses of AT&T to GTE Northwest Incorporated's Seventh Set of Data Requests, Washington Consolidated Cost Docket Nos. UT-960369,071,-71, Request No. 150, June 23, 1997.

[24] Supplemental Responses of AT&T to GTE Northwest Incorporated's Seventh Set of Data Requests, Washington Consolidated Cost Docket Nos. UT-960369,071,-71, Request No. 148, June 23, 1997.

Commission has deemed critical to universal service. The Hatfield Model blatantly fails to do so.